State: Bihar

Agriculture Contingency Plan for District: Siwan

1.0 District Agriculture profile				
1.1	**Agro-Climatic/Ecological Zone**			
	Agro Ecological Sub Region (ICAR)	Eastern Plain, Hot Subhumid (moist) Eco-Region (13.1)		
	Agro-Climatic Zone (Planning Commission)	Middle Gangetic Plain Region (IV)		
	Agro Climatic Zone (NARP)	North West Alluvial Plain Zone (BI-1)		
	List all the districts or part thereof falling under the NARP Zone	(Saran, Siwan, Goplaganj, Muzaffarpur, E. Champaran, W.Champaran, Sitamarhi, Sheohar, Vaishali, Darbhanga , Madhubani, Samastipur)		
	Geographic coordinates of district headquarters	Latitude	Longitude	Altitude
		25 ^{0} 53$^{'}$ to 26 ^{0} 23’	84 ^{0} 1$^{'}$ to 84 ^{0} 47’	77m
	Name and address of the concerned ZRS/ ZARS/ RARS/ RRS/ RRTTS	Rajendra Agricultural University, Pusa, Samastipur		
	Mention the KVK located in the district	PC,Krishi Vigyan Kendra, Regional Research Station, Bhagwanpur Hat, Siwan-845454		
	Name and address of the nearest Agromet Field Unit (AMFU, IMD) for agro-advisories in the Zone	Rajendra Agricultural University, Pusa, Samastipur		

1.2	**Rainfall**	**Normal RF (mm)**	**Normal Onset**	**Normal Cessation**
	SW monsoon (June-Sep)	988.3	2nd week of June	4th week of September
	NE Monsoon(Oct-Dec)	59.4	2nd week of October	-
	Winter (Jan- Feb)	52.9		
	Summer (Mar-May)	29.7		
	Annual	1130.3		

Source : District Profile

1.3	**Land use pattern of the district**	Geographical area	Cultivable area	Forest area	Land under non-agricultural use	Permanent pastures	Cultivable wasteland	Land under Misc. tree crops and groves	Barren and uncultivable land	Current fallows	Other fallows
	Area (‘000 ha)	222	172.3		7.3	1.0	3.1	22.4	2.7	7.2	

Source: District Profile

1. 4	Major Soils	Area (‘000 ha)	Percent (%)
	1. Black soils	86.6	50.3
	2. Sandy soils	25	14.5
	3. Sandy Loam soils	52	30.1
	4. Alkali Soils	9.5	5.5
	5. Diara Land	25.8	14.9

Source: District Profile

1.5	Agricultural land use	Area (‘000 ha)	Cropping intensity %
	Net sown area	172.3	132%
	Area sown more than once	56.0	
	Gross cropped area	228.3	

Source: District Profile

1.6	Irrigation	Area (‘000 ha)		
	Net irrigated area	122.7		
	Gross irrigated area			
	Rainfed area	49.6		
	Sources of Irrigation	Number	Area (‘000 ha)	Percentage of total irrigated area
	Canals	4821		
	Tanks	2446		
	Open wells			
	Bore wells	13615		
	Lift irrigation schemes			
	Micro-irrigation			
	Other sources	4310		
	Total Irrigated Area			
	Pump sets			
	No. of Tractors			
	Groundwater availability and use* (Data source: State/Central Ground water Department /Board)	No. of blocks/ Tehsils	(%) area	Quality of water (specify the problem such as high levels of arsenic, fluoride, saline etc)
	Over exploited			

	Critical			
	Semi- critical			
	Safe	19	100%	
	Wastewater availability and use			
	Ground water quality			
*over-exploited: groundwater utilization > 100%; critical: 90-100%; semi-critical: 70-90%; safe: <70%				

Source: District Profile

1.7 **Area under major field crops & horticulture (as per figures of 2008-09)**

1.7	**Major field crops cultivated**	**Area ('000 ha)**							
		Kharif			***Rabi***				
		Irrigated	**Rainfed**	**Total**	**Irrigated**	**Rainfed**	**Total**	**Summer**	**Grand total**
	Rice	80.1		80.1					80.1
	Wheat				104.1		104.1		104.1
	Maize			2.7					2.7

Source: District Profile

	Horticulture crops - Fruits	**Area ('000 ha)**		
		Total	**Irrigated**	**Rainfed**
	Mango	2.3		
	Litchi	1.0		
	Lemon	0.5		
	Banana	0.6		
	Guava	1.8		
	Horticulture crops - Vegetables	**Total**	**Irrigated**	**Rainfed**
	Potato	10.3		
	Onion	0.8		
	Tomato	1.3		
	Cauliflower	1.5		
	Cabbage	0.8		

	Brinjal	1.5		
	Okra	1.9		
	Chili	1.0		
	Medicinal and Aromatic crops			
	Plantation crops			
	Total fodder crop area			
	Grazing land			
	Sericulture etc			

Source: District Profile

1.8	**Livestock**	**Male ('000)**	**Female ('000)**	**Total ('000)**
	Non descriptive Cattle (local low yielding)	110	160	270
	Crossbred cattle		15	15
	Non descriptive Buffaloes (local low yielding)			
	Graded Buffaloes	49	100	149
	Goat			
	Sheep	1.5	2	3.5
	Others (Camel, Pig, Yak etc.)	45	100	145
	Commercial dairy farms (Number)			

1.9	**Poultry**	**No. of farms**	**Total No. of birds ('000)**
	Commercial		
	Backyard		

1.10 **Fisheries** (Data source: Chief Planning Officer)

A. Capture

i) Marine (Data Source: Fisheries Department)	**No. of fishermen**	**Boats**		**Nets**		**Storage facilities (Ice plants etc.)**
		Mechanized	Non-mechanized	Mechanized (Trawl nets, Gill nets)	Non-mechanized (Shore Seines, Stake & trap nets)	

ii) Inland (Data Source:	**No. Farmer owned ponds**	**No. of Reservoirs**	**No. of village tanks**

	Fisheries Department)			
	B. Culture			
		Water Spread Area (ha)	**Yield (t/ha)**	**Production ('000 tons)**
	i) **Brackish water** (Data Source: MPEDA/ Fisheries Department)			
	ii) **Fresh water** (Data Source: Fisheries Department)			

1.11 Production and Productivity of major crops (On the basis of Average of last 5 years: 2004-08)

1.11	Name of crop	**Kharif**		**Rabi**		**Summer**		**Total**		**Crop residue as fodder** ('000 tons)
		Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	Production ('000 t)	Productivity (kg/ha)	
Major Field crops (Crops identified based on total acreage)										
	Rice	130.2	1625			-	-	130.2	1625	
	Maize	12.1	950	299.6	3075	-	-	311.7	4025	
	Wheat			295.1	2835	-	-	295.1	2835	
Major Horticultural crops (Crops identified based on total acreage)										
	Mango	-	-	-	-	-	-	22	9393	
	Litchi	-	-	-	-	-	-	7.6	7244	
	Lemon	-	-	-	-	-	-	3.7	7187	
	Banana	-	-	-	-	-	-	29.8	44471	
	Guava	-	-	-	-	-	-	5.5	2899	

1.12	**Sowing window for 5 major field crops** (start and end of normal sowing period)	**Rice**	**Wheat**	**Pigeonpea**	**Maize**	**Sugarcane**
	Kharif- Rainfed					
	Kharif-Irrigated	2nd week of June to 3rd week of July		3rd week of August to 2nd week of September	3rd week of May to 4th week of June	February to March
	Rabi- Rainfed					
	Rabi-Irrigated		2nd week of November to 3rd week of December			October to November

Source: District Profile

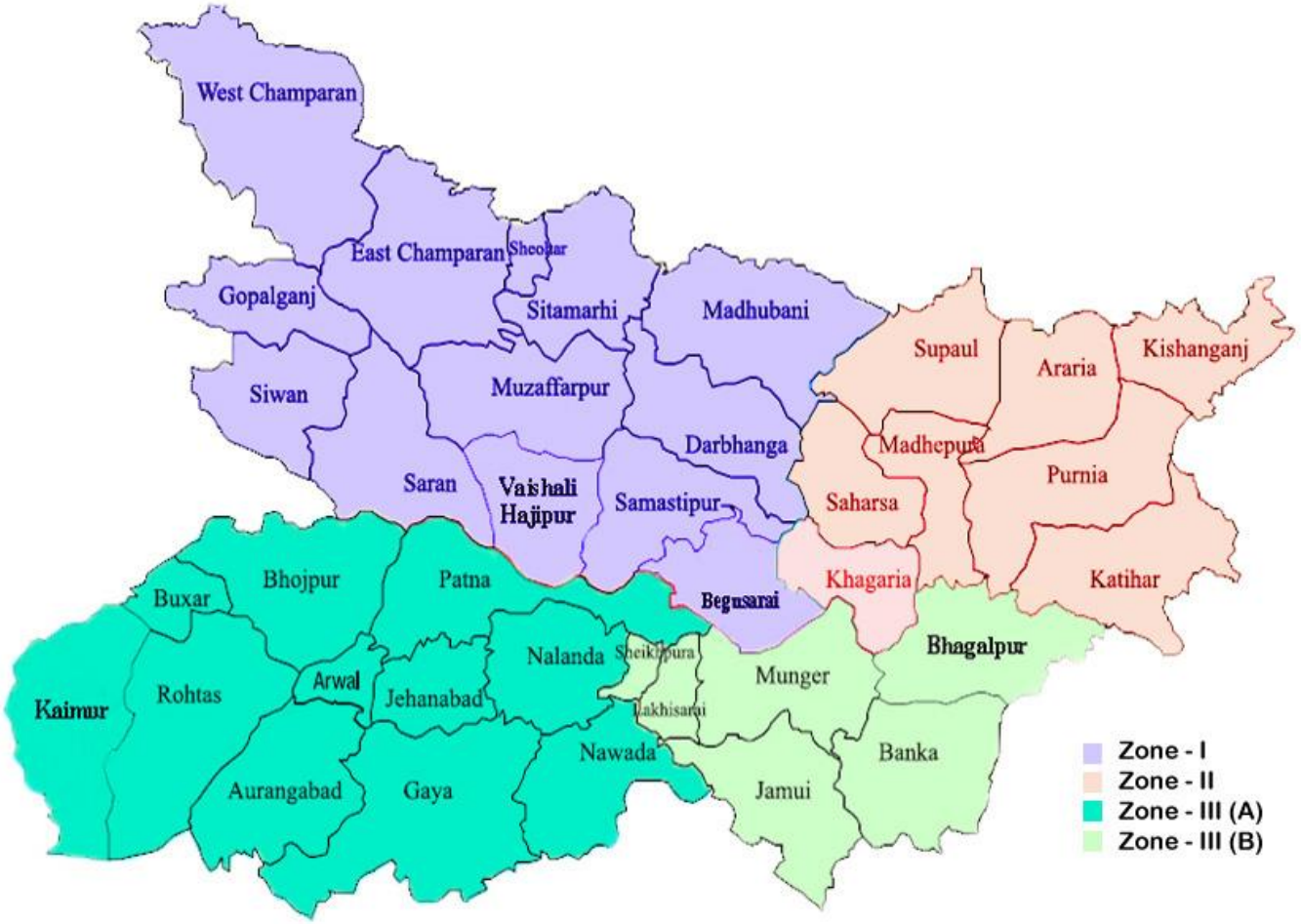
1.13	**What is the major contingency the district is prone to?** (Tick mark)	**Regular**	**Occasional**	**None**
	Drought	√		
	Flood		√	
	Cyclone			√
	Hail storm			√
	Heat wave	√		
	Cold wave	√		
	Frost		√	
	Sea water intrusion			√
	Pests and disease outbreak	√		

1.14	**Include Digital maps of the district for**	Location map of district within State as Annexure I	Enclosed: Yes
		Mean annual rainfall as Annexure 2	Enclosed: Yes
		Soil map as Annexure 3	Enclosed: Yes

Source: District Profile

Annexure I

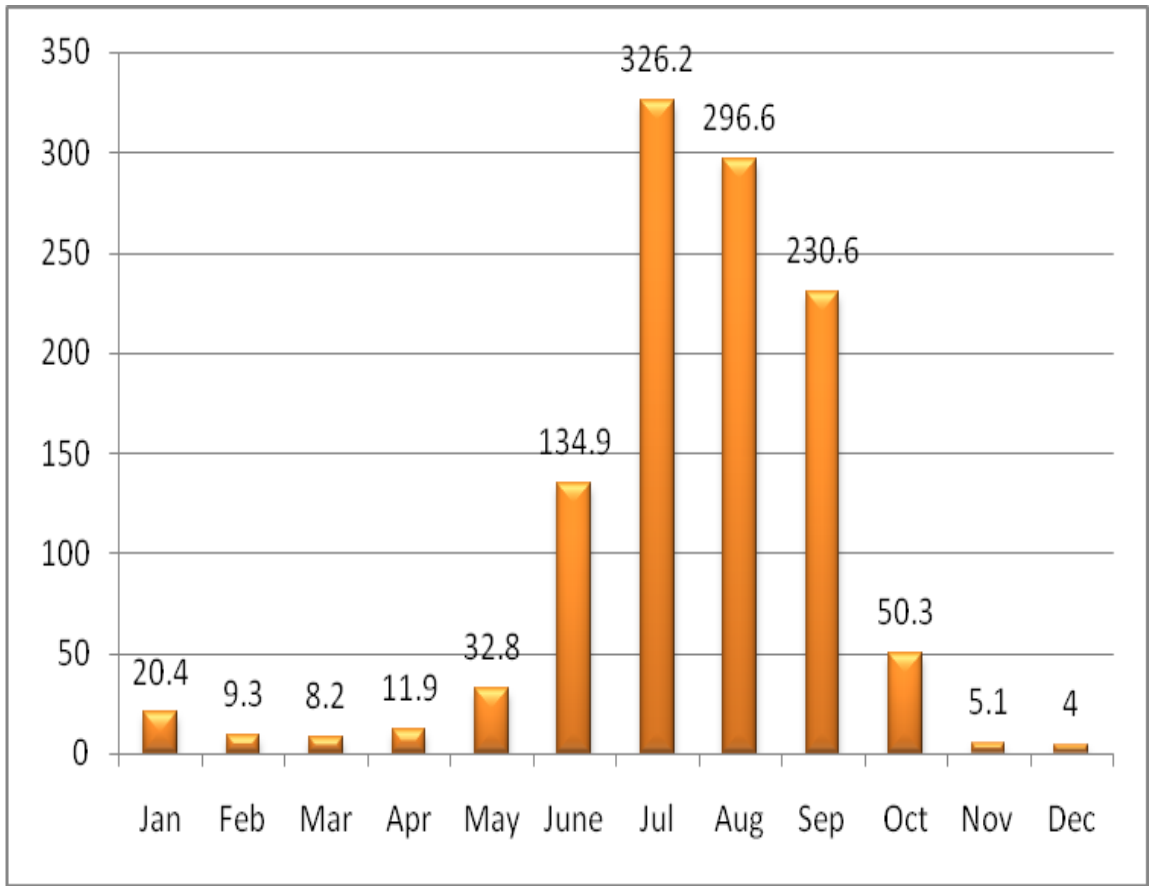
Agro climatic Zones of Bihar



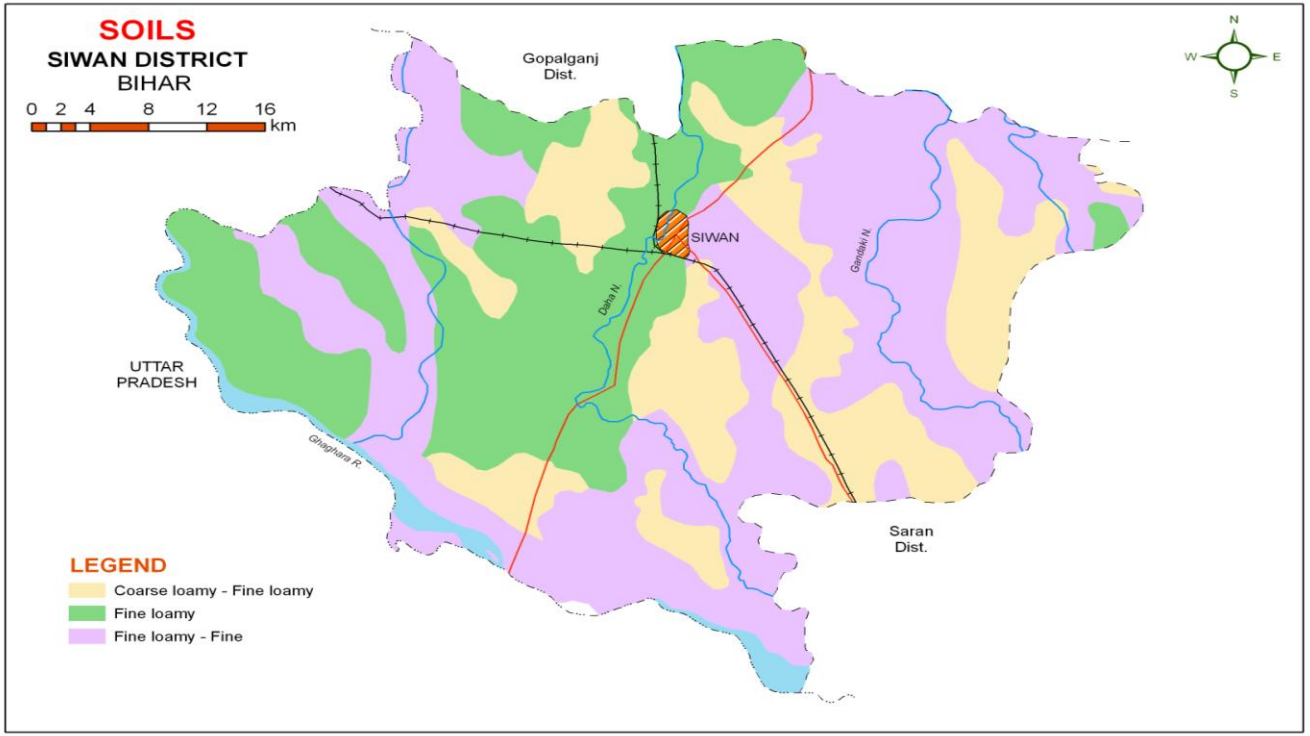
Source: krishi.bih.nic.in

Annexure II

Mean annual rainfall (mm)



Annexure-III



Source: NBSS&LUP, Kolkata

2.0 Strategies for weather related contingencies

2.1 Drought

2.1.1 Rainfed situation

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop / Cropping system**	**Change in crop / cropping system including variety**	**Agronomic measures**	**Remarks on Implementation**
Delay by 2 weeks 4th week of June	Upland light texture soil	Pigeonpea+Blackgram Pigeonpea+Sesame	Pigeonpea+Blackgram / Sesame Pigeonpea	No change	-
	Upland medium texture soil	Rice- oilseeds/ Pulses/ Vegetables Maize- pulses	Short duration Rice/ Maize- – Oilseeds / Pulses Rice- Prefer Long to medium duration varieties Kharif maize- Saktiman-1,2,3,4,5 Suwan, Deoki, Ganga-11	• Adopt normal package of practices • Direct seeding of drought tolerant varieties in dry soil in June/ July with pre emergence herbicide application under sufficient soil moisture conditions.	
	Medium land	Rice- Wheat- Greengram Rice- potato- Greengram Rice- Maize	Rice- Wheat- Greengram/ Rice- Potato- Greengram Rice- Maize Rice- Prefer Long to medium duration varieties Rice - Rajendra sweta (135-140d), Rajendra mahsuri (140-150 days), Sita (130140d), Rajendra Bhagawati, Rajendra Suwasni, Rajshree (140d)		

	Lowland Shallow lowland-(upto 25cm stagnation of water)	Rice – Wheat	Rice – Wheat Rice- Rajshree, Santosh , Sita Rajendra Suwasni, Rajendra Sweta,		
	Lowland (upto 50cm stagnation of water)	Rice – Wheat	Long duration Rice-wheat Rice- Prefer Long to medium duration varieties Rice- Rajshree (140d), Rajendra Suwasni (115-120 d), Rajendra Sweta,Mahamaya (125-130d), Birsamati (130 d), ‘ Swarna sub-1, BPT-5204, Swarna		

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 4 weeks 2nd week of July	Upland light texture soil	Pigeonpea+Blackgram Pigeonpea+Sesame	Pigeonpea+Blackgram Pigeonpea+Sesame Pigeonpea – Bahar, Pusa-9 Narendra Arhar-I	• Normal package of Practices	Seeds from RAU, Pusa, NSC, TDC , BRBN etc.

	Upland medium texture soil	Rice- Oilseeds/ Pulses/ Vegetables Maize- Oilseeds/ Pulses/ Vegetables	Short duration Rice/ Maize - Oilseeds/ Pulses/ Vegetables Rice-Prefer Medium to short duration varieties like Saroj (100-110d), Birsa Dhan-201 (100-115d) Prabhat, Sahbhagi, Dhanlaxmi, Richharia Kharif Maize- Saktiman-1,2,3,4 Suwan, Deoki, Ganga-11	• Direct seeding of rice with medium duration drought tolerant varieties with pre emergence herbicide application under sufficient soil moisture conditions followed up with a post-emergence weedicide application 20-25 days later for effective weed management. ▪	
	Medium land	Rice – Wheat- Greengram Rice- Maize	Rice-Wheat- Greengram Rice- Maize Rice – Prabhat, Sahbhagi, Rajendra Bhagawati, Rajendra Suwasni Rajshree, -44	• Where field is moist, direct seeding of medium duration varieties (125 days) can be done during second fortnight of July in midlands. Post-emergence herbicide application use is essential • Use mat nursery/ dapog nursery , mat nursery (dapog method) can be raised for quick availability of young seedlings for transplanting of medium duration varieties by first fortnight of August in mid and low lands • Raise staggered	
	Low land Shallow land (up to 25 to 50 cm stagnation of water)	Rice – Wheat- Greengram	Rice – Wheat-Greengram Direct sowing / 20d old dapog seedlings with medium to short duration varieties – BR34, Rajendra Dhan-201(130-135d), Rajendra Bhagwati		

				community nursery preferably with short duration varieties in mid and lowlands • Transplant with 30-35 days old seedling may be used with 3-4 seedling per hill with close spacing. • Para grass cultivation for fodder in low land • • Timely interculture for weed control in direct seeded rice	

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 6 weeks 4th week of July	Upland medium texture soil	Rice- Oilseeds/ Pulses/ Vegetables Maize- Oilseeds/ Pulses/ Vegetables	Short duration Rice-Pulses/Oilseeds/ Vegetables Maize- Oilseeds/ Pulses Blackgram/ Finger millet-Wheat Blackgram- Pant U-31 , Pant U-19 Finger millet- RAU7&8 Rice- Prefer short (early matured) varieties	• Direct seeding of Rice • Application of fertilizers especially phosphorous and potash to be ensured under late transplanted conditions • Life saving irrigation	Seeds from RAU, Pusa, NSC, TDC , BRBN etc.

			like Birsa Dhan 105 (85-90d), Birsa Dhan-106 (90-95d), Rajendra Bhagavathi (early-upland and midland), Dhanlaxmi , Richharia(<100d), Saroj (100-110d), Birsa Dhan-201 (100-115d)		
	Upland light texture soil	Pigeonpea – Greengram/ Sesame	Blackgram/ Finger millet-Oilseeds/Vegetables Blackgram- Pant U-31 , Pant U-19 Finger millet- RAU7&8	• Normal package and practices	
	Medium land	Rice-Wheat- Greengram Rice- Maize	Rice – Wheat- Greengram Rice- Maize Rice – Prabhat, Sahbhagi, Dhanlaxmi, Saroj	• Mat nursery (dapog method)/ Community nursery can be raised for quick availability of young seedlings for transplanting of medium duration varieties by first fortnight of August	

	Low land	Rice-Wheat-Greengram Rice-Maize	Rice -Wheat- Greengram Rice -Maize	• Direct seedling of Rice • Raise staggered community nursery preferably with medium duration varieties in mid and lowlands • Enhanced basal dose of NPK to boost the early vegetative growth • Application of fertilizers especially phosphorous and potash to be ensured under late transplanted conditions • Life saving irrigation	

Condition			**Suggested Contingency measures**		
Early season drought (delayed onset)	**Major Farming situation**	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delay by 8 weeks 2nd week of August	Upland	Rice- Oilseeds/ Pulses/ Vegetables Maize- Oilseeds/ Pulses/ Vegetables	Rice- Prefer Early matured varieties like Turanta dhan (75d), Prabhat (90d), Birsa Dhan 105 (85-90d), Birsa Dhan-106 (90-95d), Rajendra Bhagavathi (early-upland and midland), Dhanlaxmi, Richharia(<100d), Saroj (100-110d), Birsa Dhan-201 (100-115d) Rabi Pigeonpea- Greengram/ Blackgram/Sesame Rabi Pigeonpea –Pusa-9, Sharad, Arhar-I	• Moisture conservation • Inter cultivation Sowing of *rabi* crops such as Wheat, Lentil, Chickpea, Pea, Mustard (Pusa Mahak, RAU TS17), Linseed (Garima) and Vegetables	Seeds from RAU, Pusa, NSC, TDC , BRBN etc

	Medium land	Rice-Wheat-Greengram	Early duration Rice-wheat Sesame- Wheat/ Rabi Maize Rice- Prabhat, Sahbhagi, Dhanlaxmi, Richharia, Rajendra suwasani, Rajendra Bhagawati Sesame – Krishna, Pragati Mid duration Rice-Late Wheat Rice- Prabhat, Sahbhagi, Dhanlaxmi, Richharia, Rajendra suwasani, Rajendra Bhagawati	• Direct seeding of rice • Mat nursery (dapog method)/ Community nursery can be raised for quick availability of young seedlings for transplanting of medium duration varieties by first fortnight of August • Use of 20 days old dapog seedling in rice. • Enhanced basal dose of NPK in rice to boost early vegetative growth • Supply of contingency crop seeds of Toria, Maize (QPM varieties, Swann composite-65-70 days; HM-4 hybrid baby corn), Arhar (Bahar, NDA1, Pusa 9), Urd (Navin and T9), Cowpea and Horsegram need to be ensured for taking up of sowing in September in midlands • Fodder varieties of Jowar, Maize, Bajra in combination with legumes (cowpea and horsegram) can be taken up wherever feasible to meet the fodder requirements in deficit rainfall districts	

	Lowland	Rice- Potato Rice-Wheat-Greengram	Early mid duration Rice-Potato Rice- Santosh , Rajendra Suwasni, Rajendra Bhagwati Mid duration Rice-Late wheat Rice- Santosh , Rajendra Suwasni, Rajendra Bhagwati	• Double transplanting of rice (karuhan) can be done with 30 + 45 days old seedlings of long duration or photosensitive varieties up to 30th August with close planting (40-45 hills per square meter) • Application of organic manure and vermi compost initially for Rice and other crops. • Sowing of *rabi* crops such as Wheat, Lentil, Chickpea, Pea, Mustard (Pusa Mahak, RAU TS17), Linseed (Garima) and Vegetables can be taken up on time for maximizing productivity from lowlands with support from the government for timely supply of inputs and in a way *rabi* production would compensate the production loss during *kharif*. • Fodder varieties of Jowar, Maize, Bajra in combination with legumes (cowpea and horsegram) can be taken up wherever feasible to meet the fodder requirements in deficit rainfall districts	

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Condition			**Suggested Contingency measures**		
Early season drought **(Normal onset)**	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**
Normal onset followed by 15-20 days dry spell after sowing leading to poor germination/ crop stand etc.	Upland medium texture soil	Short duration Rice/ Maize-Pulses/Oilseeds/ Vegetables Rice- Prabhat, Sahbhagi Dhanlaxmi, Richharia, Kharif maize- Saktiman-1,2,3, Suwan, Deoki, Ganga-11	• Gap filling of existing crop • Thinning • Life saving irrigation	• Inter cultivation • Mulching through mechanical weeding for moisture conservation • Conservation tillage	Seeds from RAU, Pusa, NSC, TDC , BRBN etc
	Upland light texture soil	Pigeonpea- Greengram/Sesame Pigeonpea – Bahar, Pusa-9 Narendra Arhar-I	• Gap filling of existing crop • Thinning		
	Medium land	Rice-Wheat/ Potato/ Maize Rice - Rajendra Bhagawati, Rajendra Suwasni Rajshree, Prabhat ,	• Life saving irrigation • Gap filling		
	Lowland	Rice-Wheat-Greengram Rice- Maize Rice- Rajshree, Santosh , Sita, Rajendra Mahsuri, Rajendra Sweta, BPT-5204			

Condition			**Suggested Contingency measures**		
Mid season drought (long dry spell, consecutive 2 weeks rainless (>2.5 mm) period)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**

At vegetative stage	Upland medium texture soil	Short duration Rice/ Maize-Pulses/Oilseeds/ Vegetables	• Gap filling of existing crop • Postponement of top dressing •	• Inter cultivation • Mulching • Conservation tillage • Spray (1%) MOPon the crops • Life saving irrigation	
	Upland light texture soil	Pigeonpea- Greengram /Sesame			
	Medium land	Rice-Wheat/Potato-Greengram Rice- Maize			
	Lowland	Rice-Wheat-Greengram			

Condition			**Suggested Contingency measures**		
Mid season drought (long dry spell)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measues**	**Remarks on Implementation**
At flowering/ fruiting stage	Upland medium texture soil	Short duration Rice/ Maize-Pulses/Oilseeds/ Vegetables	• Foliar spray with (1%) Urea • Life saving irrigation,	• Inter cultivation • Mulching • Conservation tillage • Spray (1%) MOP on the crops • Life saving irrigation	
	Upland light texture soil	Pigeonpea- Greengram /Sesame			
	Medium land	Rice-Wheat/Potato-Greengram Rice- Maize			
	Lowland	Rice-Wheat-Greengram			

Condition			**Suggested Contingency measures**		
Terminal drought (Early withdrawal of monsoon)	**Major Farming situation**	**Normal Crop/cropping system**	**Crop management**	**Soil nutrient & moisture conservation measures**	**Remarks on Implementation**

	Upland medium texture soil	Short duration Rice/ Maize-Pulses/Oilseeds/ Vegetables	Life saving irrigation,	• Open the furrow during evening and left furrow open overnight and plank in the next morning before sunrise for growing of early rabi crops like wheat, Rabi Maize/Pulses /Oilseeds/ Vegetables	Seeds from RAU, Pusa, NSC, TDC , BRBN etc
	Upland light texture soil	Pigeonpea- Greengram /Sesame			
	Medium land	Rice-Wheat/Potato-Greengram Rice- Maize			
	Lowland	Rice-Wheat-Greengram			

2.1.2 Drought - Irrigated situation

Condition			**Suggested Contingency measures**		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Delayed release of water in canals due to low rainfall	Not Applicable				
Limited release of water in canals due to low rainfall	Not Applicable				
Non release of water in canals under delayed onset of monsoon in catchment	Not Applicable				

Condition			**Suggested Contingency measures**		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Lack of inflows into tanks due to insufficient /delayed onset of	Upland	Rice-Oilseeds Maize-Pulses Pigeonpea-Greengram Pigeonpea- Sesame	Short duration Rice/ Maize-Pulses/Oilseeds Pigeonpea- Greengram /Sesame	• Application of organic manure and vermicompost • Direct seedling of	Seeds from RAU, Pusa, NSC, TDC , BRBN etc

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
monsoon	Medium Land	Rice-Wheat/Rabi Maize/Potato	Short duration of Rice-Wheat/Rabi Maize/Potato	rice • Dapog nursery for rice • Mulching • Life saving irrigation	
	Lowland	Rice-Wheat/Maize/Potato/ Pulses/ Oilseeds Makhana (in ponds) Var. local	Medium to long duration Rice-Wheat/Maize/Potato/ Pulses/ Oilseeds		

Condition			Suggested Contingency measures		
	Major Farming situation	**Normal Crop/cropping system**	**Change in crop/cropping system**	**Agronomic measures**	**Remarks on Implementation**
Insufficient groundwater recharge due to low rainfall	Upland	Rice-Wheat Rice-Maize Maize- Wheat Pigeonpea-Greengram/Sesamee	Short duration Rice-Oilseeds/ Pulses Pigeonpea-Greengram/Sesame	• Application of organic manure and vermi compost • Dapog nursery for rice • Direct seedling of rice • Mulching • Life saving irrigation	Seeds from RAU, Pusa, NSC, TDC , BRBN etc
	Medium Land	Rice-Wheat/Rabi Maize/Potato	Rice- Wheat/Potato/ Pulses/ Oilseeds		
	Lowland	Rice – Wheat/Maize/Potato/ Oilseeds	Rice- Wheat/Potato/ Pulses/ Oilseeds Rice- Rajshree, Santosh , Sita, Rajendra Suwasni,		

2.2 Unusual rains (untimely, unseasonal etc) (for both rainfed and irrigated situations)

Condition	Suggested contingency measure			
Continuous high rainfall in a short span leading to water logging	**Vegetative stage**	**Flowering stage**	**Crop maturity stage**	**Post harvest**
Rice	• Drainage management • Re transplanting through Dapog nursery if needed	• Drainage management • Subsequently crop if totally damaged i.e.	• Drainage management • Subsequent crop if totally damaged	Storage at safer place

	• Gap filling • Re sowing through drum seeder	Toria	• Harvest at physiological maturity	
Maize	• Drainage management • Gap filling • Re sowing, if completely damaged	• Drainage management • Alternative maize or other rabi crop if totally damaged	• Drainage management • Subsequent if totally damaged • Harvest at physiological maturity	Storage at safer place
Pigeonpea	• Drainage management • September sowing if Khrif Arhar is completely damaged • Gap filling if needed	• Drainage management • Alternative maize or other rabi crop if totally damaged	• Drainage management • Subsequent if totally damaged • Harvest at physiological maturity	Storage at safer place
Horticulture				
Mango	• Drainage management • Replanting if completely damaged • Gap filling	• Drainage management	• Drenching with copper fungicides • Drainage management • Harvesting at proper maturity	
Litchi	• Drainage management • Replanting, if completely damaged	• Drainage management	• Drainage management • Spray and pasting of trunk	
Banana	• Drainage management • Replanting, if completely damaged	• Drainage management	• Drainage management • Spray and pasting of trunk	
Papaya	• Drainage management • Replanting, if completely damaged	• Drainage management	• Drainage management • Spray and pasting of trunk	• Safe storage and transportation
Heavy rainfall with high speed winds in a short span[2]				
Rice	• Drainage management • Replanting if completely damaged • Gap filling if needed	• Drainage management • Subsequent crop if totally damaged i.e. Toria	• Drainage management • Subsequent crop if totally damaged	Storage at safer place
Maize	• Re sowing If completely damaged • Gap filling if needed • Drainage management	• Drainage management • Alternative maize or other crop if totally damaged	• Drainage management • Subsequent crop if totally damaged	Storage at safer place

Pigeonpea	• Re sowing If completely damaged • Gap filling if needed • Drainage management	• Drainage management • Alternative crop if totally damaged	• Drainage management • Alternative crop if totally damaged	Storage at safer place
Horticulture				
Mango	• Drainage management • Replanting if substantially damaged	• Drainage management • Drenching with copper fungicides	• Drainage management • Harvest at proper time	
Litchi	▪ Drainage management ▪ Gap filling	Drainage management	• Drainage management • Drenching with copper fungicide	
Banana	• Drainage management • Replanting if substantially damaged	• Drainage management • Staking	• Drainage management • Harvest at proper time	
Guava	• Drainage management • Replanting if substantially damaged	• Drainage management • Drenching with copper fungicides	• Drainage management • Harvest at proper time	
Outbreak of pests and diseases due to unseasonal rains				
Rice	❖ Seedling treatment with granular insecticide – Cartap hydrochloride or phorate 10G or carbofuran 3G. ❖ Maintain shallow water in nursery beds ❖ Providing good drainage.	❖ Use copper fungicides against Bacterial leaf blight. ❖ Split application of N fertilizer (3-4 times)	❖ Harvest at physiological maturity	Proper drying and safe storage
Maize	❖ Drainage, and yellowing mainly due to nitrogen deficiency apply N split doses ❖ Application of granular insecticides viz. Thimet 10g, or Carbofuran 3g. in whorl of maize	❖ Foliar blight control through Mancozeb @ 2.5g/l or Zineb/ Maneb @ 2.5-4 g/lit of water (2-4 applications at 8-10 days interval)	❖ Cob harvesting from standing crop ❖ Harvest at physiological maturity	❖ Storage in safe places like farmer warehouse/tent covering of produce ❖ Ensure 10-12% moisture in grains before storage ❖ Proper dying
Pigeonpea	❖ Provide drainage ❖ Seed treatment with 1 g carbendizim +2g thiram/kg seed.	Provide drainage	Provide drainage	❖ Proper dying • Storage at safe place and transportation

Horticulture				
Vegetables	• Drainage management	• Drainage management	• Drainage management	
Mango	**Anthracnose:-** The foliar infection can be controlled by spraying of copper oxychloride (0.3%) Use bio control agent viz *Streptosporangium pseudovulgare* **Bacterial canker:** Regular inspection of orchards, sanitation and seedling certification are recommended as preventive measures. Mango stones for raising seedlings (root stock) should always be taken from healthy fruits. Use of wind-breaks helps in reducing brushing/ wounding and thus reduces the chance of infection.	**Anthracnose:-** Apply Carbendazim/ Thiophanate methyl (1g/lit) to control of Anthracnose. Blossom infection can be controlled effectively by spraying of Bavistin (0.1%) at 15 days interval. **Mango powdery mildew:** Spray wettable sulphur(0.2%) & calixin or karathane (0.1%) during second week of December	**Mango powdery mildew:** Prune diseased leaves and malformed panicles harbouring the pathogen to reduce primary inoculum load. Spray wettable sulphur (0.2%) when panicles are 3-4" in size Spray dinocap (0.1%) 15-20 days after first spray. Spray tridemorph (0.1%) 15-20 days after second spray. Spraying at full bloom needs to be avoided. **Mango bacterial canker:** Three sprays of Streptocycline (200 ppm) at 10 days intervals reduce fruit infection. In severe infection, spraying of Streptocycline (300 ppm) or copper oxychloride (0.3%) is more effective.	Harvest at proper time **Anthracnose:-** Pre-harvest sprays of hexaconazole (0.01%) or Carbendazim (0.1%) at 15 days interval should be done in such a way that the last spray falls 15 days prior to harvest. Diseased leaves, twigs, and fruits, should be collected and burnt to avoid the spread for next season
Litchi	Fruit Fly: Monitor adult fruit flies emrgence by using methyl eugenol or sex pheromone traps.	Fruit Fly: First Spray delta menthrin 0.0025% plus molasses 0.1% . after 10-12 days	Harvest at proper time	Fruit Fly: Collect all fallen infested fruits and put in a drum covered with

		spray fenthion 0.05% + molasses 0.1% followed by dimethoate 0.045% + molasses 0.1% if required		fine wire mesh. Harvest fully matured fruits one week earlier to escape egg laying
Banana	-	-	Harvest at proper time	
Guava	-	-	Harvest at proper time	

2.3 Floods

Condition	**Suggested contingency measures**			
Transient water logging/ partial inundation[1]	**Seedling / nursery stage**	**Vegetative stage**	**Reproductive stage**	**At harvest**
Rice	• Provide drainage • Re transplanting through Dapog nursery seedlings • Gap filling	• Provide drainage • Gap filling • 40-45 days old seedlings may be used • Kharuhan (double transplanting) mehod	• Provide drainage • Harvest at physiological maturity • Lentil as paira crop can be taken	Storage at safer place
Maize	• Provide drainage • Re sowing Gap filling	• Provide drainage	• Provide drainage • Harvest at physiological maturity	Storage at safer place
Pigeonpea	• Provide drainage • Re sowing • Gap filling if needed	• Provide drainage	• Provide drainage • Harvest at physiological maturity	Storage at safer place
Horticulture				
Mango	• Re planting • Gap filling • Provide drainage	• Drenching with copper fungicides • Provide drainage	• Drenching with copper fungicides • Provide drainage	
Litchi	• Gap filling • Replanting • Provide drainage	• Drenching with copper fungicides • Provide drainage	• Drenching with copper fungicides • Provide drainage	
Banana	• Replanting • Gap filling • Provide drainage	• Drenching with copper fungicides • Provide drainage	• Drenching with copper fungicides • Provide drainage	
Guava	• Replanting • Gap filling	• Drenching with copper fungicides • Provide drainage	• Drenching with copper fungicides • Provide drainage	

	• Provide drainage			
Continuous submergence for more than 2 days[2]				
Rice	• Gap filling, • Re sowing	• Replanting through Kharuhan (double transplanting) method by 3-4 seedlings per hill • Short duration rice variety	• Toria/Late wheat if completely damaged	Storage at safer place
Maize	• Re sowing	• Re sowing or gap filling	• Toria/Late wheat if completely damaged	Storage at safer place
Pigeonpea	Re-sowing, if damaged after receding of floods	Gap filling	Toria/late wheat, if substantial damage	Storage at safe place
Wheat	Re-sowing, if damaged after recoding of floods	Gap filling	Toria/late wheat, if substantial damage	Storage at safe place
Horticulture				
Mango	• Provide drainage			
Guava	• Provide drainage			
Litchi	• Provide drainage			
Sea water intrusion	Not Applicable			

2.4 Extreme events: Heat wave / Cold wave/Frost/ Hailstorm /Cyclone

Extreme event type	**Suggested contingency measure[r]**			
	Seedling / nursery stage	**Vegetative stage**	**Reproductive stage**	**At harvest**
Heat wave				
Maize	Provide irrigation	Provide irrigation	Provide irrigation	
Pigeonpea	Provide irrigation	Provide irrigation	Provide irrigation	
Cold wave[q]				
Wheat		Provide irrigation , Mulching		
Maize		Provide irrigation , Mulching		
Mustard		Provide irrigation , Mulching		
Potato		Provide irrigation , Mulching		
Pulses		Provide irrigation , Mulching		
Horticulture				
Vegetables		Provide irrigation, Mulching		

Frost		Provide irrigation, Mulching		
Wheat		Provide irrigation, Mulching		
Chickpea		Provide irrigation , Mulching		
Pigeonpea		Provide irrigation , Mulching		
Lentil		Provide irrigation , Mulching		
Horticulture				
Vegetables		Provide irrigation , Mulching		
Tomato & Potato		Earthing up Provide irrigation , Mulching		Harvest in dry weather
Hailstorm	Not Applicable			

2.5 Contingent strategies for Livestock, Poultry & Fisheries

2.5.1 Livestock

	Suggested contingency measures		
	Before the event*	**During the event**	**After the event**
Drought			
Floods			
Feed and fodder availability	1. Cultivation of fodder tree 2. Storage of Improved Quality Fodder 3. Conservation & Storage of • Feed & Fodder • Hay & Silage: — Preserve the fodder in the form of hay from Berseem & other grasses as well as silage from (a Maize- harvesting at well developed cob. (b) Sorghum - at flowering stage. (c) Oat (d) Hybrid Napier – 40-45 day old.	1. Feeding of Complete Feed Block 2. Feeding of Urea-Molasses-Mineral-Block & Fodder 3. Feeding of stored Hay/Silage/Improved Quality Fodder 4. Feeding of Tree leaves some of which are as follows: 1. Bamboo leaves 2. Neem 3. Banyan 4. Peepal 5. Seesam 6. Subabul	Production of forage crops 1. Balanced feeding of Animal supported with little higher concentrate mixture 2. Cultivation of fodder Rabi maize if water stagnated upto Nov/ December 3. Jowar/Cowpea 4. Maize in September

	(e) Water hycianth mixing with Paddy straw in ratio of 4:1 with 70 kg molasses /ton of clean water hycianth. (f) Potato leaves mixing with wheat straw in ratio of 7:1 and should be supplemented with 3% molasses. Hay: – • Berseem/Lucerne and other grasses. • Bales of hay and other dry fodder should be stored in dry places at a height of last flood level and covered with asbestos sheet or polythene sheet. 4. Development & storage of: – (a) Complete Feed Block (CFB) (b) Urea-Molasses-Mineral-Block (U.M.M.B) 5. Development of Fodder Bank	Use of unconventional feed stuff: (i) Aquatic Plants – water hycianth (i) Lotus (ii) Aquatic weeds	
Drinking water			
Health and disease management	Veterinary Preparedness with Medicines, Vaccines and provision for mobile ambulatory van. • Vaccination During flood stress becomes an incriminating factor for the precipitation of diseases in livestock and poultry. So, necessary vaccination of livestock and poultry should be done against economically important contagious disease. This will be helpful not only to check epidemic in animals, but also to reduce the probability of zoonoses in human beings. Care should be taken for mass vaccination of livestock and poultry	Animal safety, Health camp and Treatment Important Suggestions for animal and Poultry safety During flood, all efforts should be made to rescue most of the livestock and poultry as carefully as possible. The people should be made conscious through announcement with the help of mikes or other means of communication, so that they may escape with their livestock and poultry to safe area. The fisherman or the people who knows swimming should be deputed for the rescue of drowning and	Sanitation, deworming, treatment, health camps Culling of Sick animals and disposal of carcass Maintenance of Sanitation: Adequate attention is to be paid to disinfect the premises of temporary sheds with the help of bleaching powder, phenol, carbolic acid etc. In no case the carcass/ cadaver should come in contact with healthy animals rehabilitated in sheds. Arrangements should be made accordingly. De-worming after the flood:

	with a view to covering 80% of livestock population in order to achieve herd immunity. Mass vaccination should be conducted by a team of Department staff with proper maintenance of detailed Inoculation Register. Pro-active steps should be taken to receive and stock the required doses of vaccines against different diseases for their use in face of Flood.	floating animals and birds. During flood do not leave halter or headstalls on animals. Do not tie animals together when releasing. Report the location, identification and disposition of livestock and poultry to authorities handling the disaster. Health camp and treatment Water borne diseases are one of the most common phenomena during the flood Diarrhoeal diseases outbreaks can Report the location, identification and disposition of livestock and poulrty to authorities handling the disaster. Health camp and treatment Water borne diseases are one of the most common phenomena during the flood Diarrhoeal diseases outbreaks can occur after drinking contaminated water. Diseases that can occur during flood should be given special attention and accordingly medicines should be available in the health camp for the following mentioned diseases. Salmonella spp.	Immediately after flood, the animals like cattle, buffalo. Sheep, goat, pig, dog and poultry need to be de-wormed with suitable broad spectrum anthelmentics. This will enable the animals to regain proper health. In water logged area, sucks can be introduced as biological control measures against snails to protect livestock from parasitec disease. Treatment of sick animals: The Disposal of Carcass: the disposal of dead animals and birds are to be done by Animal Husbandry Department. Accordingly, necessary arrangement should be made for prompt and easy disposal of carcasses during the Flood and Post-Flood period. Carcasses of animals affected by the disease are the chief source of soil infection. They harbour the germs in large numbers and liberate them from both artificial and natural body openings into the surrounding soil. Methods of Carcass disposal to be

		Escherichia coli Giardiasis Amoebiasis Rotavirus Leptospirosis Scabies Black leg Malignant Edema Foot rot Anthrax Botulism Tetanus Red water Black disease Entertoxemia Liver fluke Amphistomiasis Brooders pnemonia Treatment of Non infectious arrangement should be made for the treatment of drowning and traumatic injuries, aspiration pneumonia, lameness and other surgical cases in the health camp. Disinfection of livestock premises and Poultry shed Disinfection of livestock premises and the temporary sheds should be done with the help of bleaching powder, phenol, carbolic acid etc	adopted Burial Burning Composting Vulturing s. Health Camp after the flood: Protection of livestock from out breaking and communicable diseases be made. Health camps are to be organised in Flood affected areas to restore the normal breeding capability of breedable population as well as to restore the normal health of livestock and poultry.
Cyclone			
Heat wave and cold wave			

* based on forewarning wherever available

2.5.2 Poultry

	Suggested contingency measures			Convergence/linkages with ongoing programs, if any
	Before the event[a]	**During the event**	**After the event**	
Drought				
Floods				
Health and disease management	**Vaccines to be used for different animals and Poultry** **Cattle and Buffalo** Hemorrhagic SepticemiaVaccine Black Quarter Vaccine FMD Vaccine Anthrax Vaccine as per endemicity. **Sheep and Goat** Hemorrhagic Septicemia Vaccine PPR Vaccine FMD Vaccine Goat pox Vaccine Enterotoxemia Vaccine Anthrax Vaccine as per endemicity **Pigs** Hemorrhagic Septicemia Vaccine PPR Vaccine FMD Vaccine Goat pox Vaccine Enterotoxemia Vaccine Anthrax Vaccine as per endemicity. **Dogs** Rabies Vaccine **Poultry** Mareks disease vaccine RDV (F_1 & R_2B), FPV,			

	IBRV & IBDV **(Annexure-1)** • **Medicines** All Districts should be earmarked for flood. An inventory of required medicines to treat the affected livestock in case of eventualities should be made. The Govt. should take steps to procure sufficient quantity of essential life saving medicines. **List of life saving Medicines** Corticosteroids Nikethamide Antibloat Adrenaline Antihistaminic Antidotes for common poisoning Antisnake venom Broad spectrum antibiotics Anti-inflammatory Antipyretic and Analgesics Fluids and Electrolytes • **Mobile Veterinary Clinics** Mobile Veterinary Clinics should be kept ready at Veterinary Hospital or Veterinary Camps so that immediate treatment of injured and affected animals may be done. For this MVC must have adequate drugs like antibiotic, analgesic, dewormer, ointment, antisnake venom and emergency health care facilities along with trained personnel. A good no. of mobile clinic teams should be planned consisting dedicated and			

	experienced technical workers with allotment of area of operation. The teams should be kept in readiness **having required stock of medicines and equipment** to work in any adverse situation. A telephone directory should be maintained at the District level by collecting the telephone nos. of Vets, Para-Vets, NGOs / youth clubs / societies, volunteers etc. to collect feedback and plan the activities during the emergency. An emergency kit for poultry should be made ready well in advance. The Poultry kit should have Cage, mask, mash, pellet feed trough, waterers, detergents, poultry vaccines, Veterinary drugs, workers protection uniform etc.			
Cyclone				
Heat wave and cold wave				

[a] based on forewarning wherever available

2.5.3 Fisheries/ Aquaculture

	Suggested contingency measures		
	Before the event[a]	**During the event**	**After the event**
1) Drought			
A.Capture			
B. Aquaculture			
(i) Shallow water in ponds due to insufficient rains/inflow	(i) Thinning of population (ii) Arrangement of water supply from	(i) Partial harvesting (ii) Addition of water	(i) Maintenances of remaining stock till favorable condition

	external resource	(iii) Stocking of air breathing fishes	achieved (ii) If not feasible, total harvesting or transfer of fishes may be done. (iii) Preparation of the pond for next crop.
(ii) Impact of salt load build up in ponds / change in water quality	(i) Regular monitoring of water quality parameter. (ii) Arrangement of aeration (iii) Addition of water from external resource	(i) Arrangement of aeration. (ii) Addition of water a. Monitoring of water quality b. Reduction of manuring according to water level.	
2) Floods			
A. Capture			
B. Aquaculture			
(i) Inundation with flood water	(i) Elevation/ Renovation of pond dyke. (ii) Sale of Table/marketable size fishes (iii) construction of earthen nursery ponds in upland areas	Collection of naturally bred seeds (Spawn /fry /fingerling) from flooded water Stocking in nursery ponds for rearing	-Retain the water in pond immediately after flood through repairing of damaged dyke etc. -Netting of pond -Removal of unwanted, predatory/weed fishes -Sell of large size fishes
(ii) Water contamination and changes in water quality	Arrangement of regular water quality monitoring		
(iii) Health and diseases	(a) Use lime/ potassium permanganate (b) Arrangement of CIFAX and medicines & chemical stock		-Sampling of fishes and water for disease analysis - Liming, use of drugs/ medicine if required in consultancy of fisheries experts
(iv) Loss of stock and inputs (feed, chemicals etc)	Raising the height of dyke by fencing with net and bamboo poles to prevent loss of stock	Arrangement of advance size fingerling/ yearlings for stocking	Stocking of large size fingerlings carp Fertilization of pond and regular feeding of fish Harvesting and sale of fish
(v) Infrastructure damage (pumps, aerators, huts etc)	Repairing/ arrangement of alternate safe place to keep pumps aerators etc.	A regular water on the flood and infrastructure facilities.	Re establishment of the infra structural facility.
3. Cyclone / Tsunami			

4. Heat wave and cold wave			